(10th). The lowest minima were: 5, Sault Ste. Marie (19th); 9, Marquette (19th); 10, Alpena (19th); 12, Northfield (20th); 14, Duluth (19th); 15, Eastport (20th); 16, Moorhead (19th).

The *limits of minimum temperatures*, 32° and 40°, are shown by lines on Chart No. V.

The *years of highest maximum and lowest minimum temperatures* for April are given in the last four columns of Table I of the REVIEW for 1896. During the current month the maximum temperatures were equal to or above the highest on record at: Red Bluff, 93; Roseburg, 90; Portland, Oreg., 89; Northfield, 82; Fort Canby, 80; Astoria and Point Reyes Light, 78; Lander, 76; Tatoosh Island, 68. The minimum temperatures were not the lowest on record at any regular station of the Weather Bureau.

The *greatest daily range of temperature and the data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Marquette, 53; Williston, 51; San Luis Obispo, 50; Northfield, Winnemucca, and Carson City, 45; Lander, 44.

Among the *extreme monthly ranges* the largest were: Moorhead, 74; Williston and Northfield, 70; Huron, 66; Marquette, 65; Duluth and Pueblo, 64. The smallest values were: Key West, 18; Jupiter, 24; Port Eads, 26; Tatoosh Island, 30; Galveston and Corpus Christi, 31.

Accumulated monthly departures from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+ 5.2	+ 1.3	North Dakota	— 7.0	— 1.8
Middle Atlantic	+ 2.9	+ 0.7	Northern Slope	— 4.6	— 1.2
South Atlantic	+ 1.0	+ 0.2	Southern Plateau	— 5.1	— 1.3
Florida Peninsula	+ 2.5	+ 0.6	Middle Plateau	— 9.3	— 2.4
East Gulf	+ 0.6	+ 0.1	North Pacific	— 1.4	— 0.4
West Gulf	+ 5.2	+ 1.3	Middle Pacific	— 4.0	— 1.0
Ohio Valley and Tenn.	+ 2.4	+ 0.6	South Pacific	— 2.9	— 0.4
Lower Lake	+ 5.2	+ 1.3			
Upper Lake	+ 8.8	+ 2.2			
Upper Mississippi Valley	+ 2.6	+ 0.6			
Missouri Valley	+ 0.5	+ 0.1			
Middle Slope	+ 1.5	+ 0.4			
Northern Plateau	+ 4.5	+ 1.1			
Southern Slope	+ 0.0	+ 0.0			

PRECIPITATION.

[In inches and hundredths.]

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month exceeded 6 inches in the greater portion of southern Louisiana, southeastern Missouri, central Iowa, southern Illinois, Indiana, Tennessee, and Kentucky, as also in southern Nova Scotia.

The larger values for regular stations were: Port Eads, 11.70; Jupiter, 8.47; Tatoosh Island, 7.61; Cairo, 6.49.

Little or no rain fell in southern California, Nevada, Arizona, New Mexico, and western Texas.

Details as to *excessive precipitation* are given in Tables XI and XII.

The *years of greatest and least precipitation* for April are given in the REVIEW for April, 1890. The precipitation for the current month was the greatest on record at: Port Eads, 11.70; Jupiter, 8.47; Des Moines, 7.37; Vineyard Haven, 5.95; Oklahoma, 5.87; Alpena, 4.59; Concordia, 4.20. It was the least on record at: Los Angeles and San Diego, 0.02; Carson City, 0.03; Point Reyes Light and Port Angeles, 0.48; Cleveland, 1.34.

The *diurnal variation*, as shown by tables of hourly means of the total precipitation, deduced from the self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The *average departure* for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: New England, 121; Florida Peninsula, 315; east Gulf, 130; Ohio Valley and Tennessee, 112; upper Lake, 126; upper Mississippi Valley, 127; Missouri Valley, 137; middle Slope, 148.

Normal: Southern Plateau, 100.

Below the normal: Middle Atlantic, 77; south Atlantic, 91; west Gulf, 60; lower Lake, 87; North Dakota, 59; northern Slope, 75; southern Slope, 50; middle Plateau, 56; northern Plateau, 76; north Pacific, 61; middle Pacific, 39; south Pacific, 11.

The *current departures* from the normal precipitation are given in Table I, which shows that precipitation was in excess in the east Gulf States, the Tennessee and Ohio valleys, the Mississippi and lower Missouri valleys, the central Lakes, the St. Lawrence Valley, New England, and Nova Scotia. It was deficient in the west Gulf States, the Rocky Mountain Plateau and Pacific Coast regions. The large excesses were: Port Eads, 8.7; Jupiter, 6.0; Des Moines, 4.6. In Canada, Yarmouth, 4.2; Halifax, 2.9; Rockliffe, 2.8; Port Stanley, 2.2. The large deficits were: Kittyhawk and Astoria, 3.1; Cape Henry, 3.0; Norfolk and Fort Canby, 2.6. In Canada, Swift Current, 1.1.

The *total accumulated monthly departures* from January 1 to the end of the current month are given in the second column of the following table: The third column gives the percentage of the current accumulated precipitation relative to its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
Florida Peninsula	+ 4.40	141	New England	— 1.70	86
East Gulf	+ 1.00	105	Middle Atlantic	— 2.80	89
Ohio Valley and Tenn.	+ 2.80	117	West Gulf	— 0.90	94
Upper Lake	+ 0.50	105	Lower Lake	— 0.80	93
North Dakota	+ 0.80	119	North Pacific	— 0.80	97
Upper Mississippi Valley	+ 4.10	147	Middle Pacific	— 1.10	93
Missouri Valley	+ 3.50	148			
Northern Slope	+ 0.40	111			
Middle Slope	+ 1.90	136			
Abilene (southern Slope)	+ 0.50	115			
Southern Plateau	+ 1.50	176			
Middle Plateau	+ 0.90	116			
Northern Plateau	+ 0.20	103			
South Pacific	+ 1.20	116			
South Atlantic	+ 0.00	100			

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer. The mean wet-bulb temperature is now published in Table I; it is always intermediate, and generally about half way between the temperature of the air

and of the dew-point. The quantity of water evaporated in a unit of time from the muslin surface may be considered as depending essentially upon the wet-bulb temperature, the dew-point, and the wind.

The *relative humidity*, or the ratio between the moisture that is present in the air and the moisture that it would contain if saturated at its observed temperature is given in Table I as deduced from the 8 a. m. and 8 p. m. observations. The general average for a whole day or any other interval would properly be obtained from the data given by an evaporometer, but may also be obtained, approximately, from frequent observations of the relative humidity.

SNOWFALL.

The *total monthly snowfall* at each station is given in Tables I and II; its geographical distribution is shown on Chart V. This chart also shows the isotherms of minimum 32° and of minimum 40° for the air within the ordinary thermometer shelter. The former isotherm is an approximate limit to possible snow, while the latter is an approximate southern limit to the regions that report frost in exposed localities.

Snowfalls are reported as follows: 1 to 15 inches in northern New England and western Nebraska; 1 to 6 in northern New York and Ohio; 1 to 9 in northern Michigan and Wisconsin; 1 to 13 in the Dakotas. In the Rocky Mountain Region the highest reported snowfalls were: Colorado, 40; Nevada and California, 16; Oregon, 36; Washington, 14.

The *depth of snow on the ground* at the end of the month is usually shown on Chart VI; it is also shown on the weekly charts of the Climate and Crop Service. At the close of April the snow was confined to isolated mountainous regions and is, therefore, not charted.

In Canada.—The following items are gathered from the map for April published by Prof. R. F. Stupart:

British Columbia, the first appearance of Pacific Coast summer type of weather was on April 11, as compared with June 13, 1896. In Osoyoos and Okanagan, after March the weather turned suddenly mild and snow disappeared; everything more advanced than usual. Nicola, snow had gone by the 10th and plowing began. Lower mainland, fruit trees promising good crops, owing to unusual warmth and consequent disappearance of the snow. Northwest Territories and Manitoba, Red River Valley, owing to the melting of an unusually large accumulation of snow, much damage has been done by flooding. Calgary, snow has disappeared. Battleford, vegetation is slow, considering the length of time since the snow melted. Quebec, snow all gone on the 22d.

ICE.

The *thickness of ice* in the rivers and harbors is shown in detail in the bulletins published by the Weather Bureau every Monday during the winter months. No special reports are at hand for April.

In Canada.—Prof. R. F. Stupart reports:

At the close of the month, Calgary, the river is low and free from ice. Prince Albert, river opened on the 19th and is very high. Quebec, navigation opened on the 25th. Charlottetown, P. E. I., ice in the harbor began to break up on the 13th. St. John, N. B., navigation opened on the St. John River on the 24th.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 3, 8, 30. Arizona, 26. Arkansas, 3, 7, 8, 13, 29. California, 1, 19, 20, 26, 27. Colorado, 7, 23, 24, 27, 28, 29, 30. Connecticut, 28. Florida, 9, 15, 19. Georgia, 5, 6, 9, 29, 30. Idaho, 5, 6, 20, 21. Illinois, 8, 16, 18, 22, 23, 24. Indiana, 11, 13, 16, 23. Indian Territory, 1, 3, 8, 9, 13. Iowa, 4, 16, 20 to 24, 28. Kansas, 1, 2, 3, 6, 8, 9, 19, 21 to 24, 27, 28. Kentucky, 8, 11, 16, 19, 26, 30. Louisiana, 2, 3, 5, 6, 9, 28, 29. Massachusetts, 28. Michigan, 4, 13, 23, 25, 26. Minnesota, 9, 21, 27. Mississippi, 1, 3, 29. Missouri, 1, 3, 7 to 10, 12, 13, 19, 20, 22, 23, 28, 29. Montana, 1, 10, 29. Nebraska, 1, 3, 8, 9, 20 to 24, 28. New Jersey, 5. New Mexico, 26. New York, 5, 17, 19, 22, 23. North Carolina, 5, 8. North Dakota, 3, 4, 5, 7, 10, 11. Ohio, 5, 11, 13, 16, 19, 23, 30. Oklahoma, 1, 7, 9, 13, 23, 27. Oregon, 4, 5, 6, 19, 21, 26. Pennsylvania, 5, 6, 16, 19, 26. Rhode Island, 6. South Carolina, 5, 26. South Dakota, 8, 27. Tennessee, 4, 5, 8, 11, 29. Texas, 6, 7, 13, 14, 21. Utah, 1 to 4, 7, 20, 22. Virginia, 16. Washington, 4, 6, 21. Wisconsin, 21, 24. Wyoming, 20.

SLEET.

The following are the dates on which sleet fell in the respective States:

Colorado, 6, 23. Connecticut, 28. Idaho, 4, 5. Illinois, 1, 7, 9, 12, 16, 20, 23. Indiana, 8, 9, 16. Iowa, 1, 9, 10, 20. Kentucky, 16. Maine, 9. Massachusetts, 27. Michigan, 6, 7, 9, 16, 18, 29, 30. Minnesota, 5, 8, 11. Missouri, 3, 8, 10, 19, 20. Nebraska, 1, 2, 7, 8, 19, 28. Nevada, 1, 6, 19 to 23, 27. New Hampshire, 5, 11, 27. New York, 7, 9, 17, 27. North Carolina, 1, 2, 10. Ohio, 7 to 11, 13, 16, 17, 20, 21. Oregon, 2, 6. Pennsylvania, 26, 27. South Dakota, 5, 12, 27, 28. Tennessee, 9. Utah, 6, 24. Vermont, 9. Wisconsin, 2, 5, 7, 12, 13, 15, 23, 30.

WIND.

The *prevailing winds* for April, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

HIGH WINDS.

Maximum wind velocities are given in Table I, which also gives the altitudes of the Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Amarillo, Tex	7	56	n.	Dodge City, Kans	28	50	n.
Do	11	54	n.	El Paso, Tex	2	60	sw.
Do	23	60	se.	Fort Canby, Wash	21	52	s.
Do	28	58	n.	Lincoln, Nebr	28	50	n.
Buffalo, N. Y	19	54	w.	New York, N. Y	26	50	nw.
Do	26	54	w.	Do	27	58	nw.
Carson City, Nev	6	59	w.	Sioux City, Iowa	18	54	nw.
Chicago, Ill	18	67	s.	Do	27	52	s.
Do	23	53	s.	Tatoosh Island, Wash.	16	55	e.
Do	23	50	s.	Winnemucca, Nev	6	60	nw.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 5th, 152; 8th, 127; 23d, 159; 24th, 131. Reports were most numerous in: Illinois, 155; Iowa, 114; Louisiana, 105; Missouri, 176.

Thunderstorm days were most numerous in: Florida, Kan-